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LOGISTIC REGRESSION MODEL
IN POVERTY ANALYSES

Abstract: The main aim of this article is to establish poverty determinants – the factors that increase the risk of poverty – as well as to estimate the extent to which households are threatened by this phenomenon by means of the logistic regression model. The second goal of this paper is an attempt at estimating and comparing poverty spheres in a regional approach by means of the most important poverty indicators. The source of data in both cases is unidentifiable unitary data from household budget research carried out by CSO in 2008 and made available for academic research.

Keywords: objective poverty, poverty indicator, relative risk, logit model, chance quotient.

1. Introduction

In Copenhagen in 1995, absolute or extreme poverty was defined as: "a condition characterised by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information" – therefore, mainly depending on the access to a range of services. The EU's social inclusion process uses a relative definition of poverty that was first agreed by the European Council in 1975: "people are said to be living in poverty if their income and resources are so inadequate as to preclude them from having a standard of living considered acceptable in the society in which they live".

However poverty means not only the lack of funds sufficient for satisfying basic needs but also a limit as far as free choice of life style is concerned, which in consequence may lead to social exclusion.[1] One of the main aims of social politics is decreasing the range of poverty and social exclusion.

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[1] The European Union had declared 2010 to be the European Year for Combating Poverty and Social Exclusion. The basic goals of the Year are to increase the public awareness on the topics of poverty and social exclusion as well as to foster the political engagement of the European Union and its member countries in the fight against those problems.

Different concepts of poverty and their evolution have been discussed by a majority of scholars dealing with both methodology and empirical research in that field. The overview of different approaches can be found for example in the following works: [Atkinson 1970; Kanbur 2002], and in Polish literature of the subject: [Panek, Podgórski, Szulc 1999; Panek (ed.) 2007; Radziukiewicz 2007].

A detailed overview of the methods used in measuring poverty and social exclusion and applied by public statistics, enriched with results of empirical analyses can be found in [Topińska (ed.) 2008]. The work [Golinowska et al. 2008] includes an overview of both Polish and foreign research on poverty and social exclusion, analyzed from the point of view of varied concepts, applied research methods as well as significance and quality of obtained results.

One can distinguish two approaches to poverty analyses: the classical and the multivariate one. In the classical approach the estimation of the level of the satisfaction of needs is done by means of income (or expenditure) analysis and the distinguishing of the subpopulation of the poor is possible once a critical level of household's income – known as poverty threshold – is defined. This threshold can be set in an objective or subjective way.

A broader look at the issue of poverty can be traced in the multivariate approach where factors other than income or expenditure are taken into account and the fundamental question refers to the selection of those factors determining the size of poverty.[2] In order to establish the extent of poverty risk in this approach many scholars employ fuzzy set theory as they intend to define the poverty sphere membership functions on the basis of distinguished poverty symptoms [Lemmi, Betti (eds.) 2006; [Panek (ed.) 2007]). In recent years there have been works that used logit and probit models in order to allow a better distinguishing of poverty determinants – the factors that increase the poverty risk [Czapiński, Panek (eds.) 2009; Kasprzyk, Fura 2011].

In poverty analyses there are several factors that have a decisive influence on the identification and evaluation of the poverty sphere and these are – among others – the following: the establishment of poverty determinants, therefore the factors that increase the poverty risk; the choice of the method used to mark the poverty lines; and the choice of determined indicators that are employed in the estimation and space and time comparison of the range and depth of this sphere.

The main aim of this paper is the attempt at applying the logit regression model in order to establish poverty determinants as well as indicating which of the proposed factors influence the probability of a certain type of household falling into the sphere of relative poverty. *Relative poverty is the condition of having fewer resources or less income than others within a society or country, or compared to worldwide averages.*

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[2] The basic problems related to the multivariate approach are discussed in detail e.g. in [Thorbecke 2008].

The second aim is the evaluation and comparison of the sphere of relative poverty in a regional approach while using the basic and most often employed indicators of poverty – that is the relative poverty rate and average expenditure gap.

The analysis of the poverty sphere requires establishing the poverty line. In this paper the analysis is concerned with relative poverty, which is a relative lack of funds for maintaining a household [Rusnak 2007]. The expenditure of households have been used as the indicator of a household's wealth; an original equivalence OECD 0.7/0.5 scale[3] has been employed in order to calculate equivalent expenditure and make it possible to compare households of different size and demographic composition. Half of the average equivalent expenditure calculated for the collective of all households studied in 2008 BBGD households' budget research has been used as the relative poverty line.[4]

The basis for all calculations were – bought specifically for this purpose – individual data from the BBGD households' budget research carried out by the CSO in 2008. **All calculations were prepared using software Statistica.**

2. Logistic regression model (logit model)

The *logit model* is used for studying the relationship between the binary variable Y – which assumes only two values symbolically marked as 1, 0 – and variables X_1, X_2, ..., X_m, which can be both quantitative and qualitative variables.

What we want to find is the relationship between the probability of Y assuming the value 1 and the value of explained variables X_j. Let $p = P(Y = 1)$, and let x_j be the value of variable X_j. The simplest dependence is the linear dependence:

$$P(Y = 1) = p = a_0 + \sum_{j=1}^{m} a_j x_j. \tag{1}$$

Parameters a_0, a_1, ..., a_m can be then established by means of the least squares method (LS). However, for some values of x_j the probability p may lie outside the [0, 1] interval, which is contrary to the basic property of probability. In order to avoid such contradictions the value of probability is transformed. The most frequently found transformation is *logit function*:

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[3] In accordance with this scale the first adult person in a household is attributed with a value of 1, every next one with 0.7, and every child under 14 with the value of 0.5. Although OECD scales are commonly used, many works are published that propose new, original ways of defining these scales or including authors' own modifications of the established methods (e.g. [Rusnak 2003, 2007; Szulc 1992, 2003]).

[4] Such poverty line is set by the Polish CSO for the purpose of the domestic analyses of the relative poverty sphere. The relative poverty line employed by EUROSTAT for the purpose of international comparison is established as a percentage (usually 60%) of the equivalent income median, for the calculation of which the modified OECD type 0.5/0.3 scale is used.

$$\text{logit}(p) = \ln\left(\frac{p}{1-p}\right), \tag{2}$$

where $\left(\dfrac{p}{1-p}\right)$ denote odds that Y assumes the value 1.

As a result of that transformation one obtains the *logit model*:

$$\text{logit}(p) = a_0 + \sum_{j=1}^{m} a_j x_j = X^T \cdot A, \tag{3}$$

where A stands for the parameter vector of the $A=[a_0, a_1, ..., a_m]$ model, and X^T for the explanatory variables vector. Using, for example, the maximum likelihood method (ML), one is able to estimate the vector of parameters A, and then calculate probability p according to the formula

$$P\left(Y=1\right) = p = \frac{e^{X^T \cdot A}}{1 + e^{X^T \cdot A}}. \tag{4}$$

Directional parameter a_j has the following interpretation: if the value of x_j increases by 1 unit, the chance that $Y = 1$ increases e^{a_j} times.[5]

We can also define the odds ratio θ. In table 2×2 when $X = [x_1, x_2]$ and $Y = [0,1]$ the formula is

$$\theta = (P1/P2), \tag{5}$$

where $P1 = \dfrac{P(Y=1/X=x_1)}{P(Y=0/X=x_1)} = \dfrac{P_{1/1}}{P_{0/1}}$ and $P1 = \dfrac{P(Y=1/X=x_2)}{P(Y=0/X=x_2)} = \dfrac{P_{1/2}}{P_{0/2}}$ \hfill (6)

When $1 < \theta < \infty$ the odds that $Y = 1$ are higher for $X = x_1$ than for $X = x_2$.

3. Poverty indicators

The problem of determining the size of the poverty sphere can be limited to the choice of the proper poverty indicators that are constructed on the basis of various poverty lines and allow one to estimate the range, depth, acuteness or intensity of a given type of poverty. These indicators have been discussed in detail in works by Polish and foreign scholars, e.g. [Topińska (ed.) 2008; Panek (ed.) 2007; Kakwani 1980; Rusnak 2007].

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[5] The logit model is described on the basis of [Agresti 1990] and [Gruszczyński 2002] where the issues related to these models from the point of view of both theory and empirical application are discussed in detail.

Among the simplest and most frequently used indicators that determine the poverty sphere there is the poverty rate as well as the average expenditure or income gap.

If X is a random variable and stands for the expenditure or income of a household characterized by cumulative distribution function $F(x)$ and average value $E(X) = \mu$, and x^* is the appropriate poverty line, then the indicator characterizing the range of poverty is poverty rate P_0, which can be formulated as

$$P_0 = F(x^*). \tag{5}$$

The poverty rate determining the fraction of poor people (or households) has an important drawback as it does not allow one to estimate the degree in which households considered poor are actually touched by this phenomenon: do these households have a level of income close to the poverty line or is their income close to zero? Moreover, this indicator is insensitive to the drop in the income of households considered poor as well as to the transfers of income between poor households and the transfers of income from poor households toward wealthy ones.

A solution can be found in the form of average expenditure (or income) gap that can be formulated as follows:

$$P_1 = \frac{1}{n \cdot x^*} \sum_{i=1}^{n_p} \left(x^* - x_{iek} \right), \tag{6}$$

where n and n_p stand for the number of all people (or households) examined in the research and the number of poor people or households respectively, and x_{iek} – equivalent income or expenditure of the i-th person (or household) considered poor. This indicator informs us about the extent (in percent) to which the expenditure (income) of households considered poor is lower than the value assumed as the poverty line. Furthermore, the poorer the household, the bigger is its share in the measurement of the depth of poverty.

4. Poverty determinants. Empirical results

This part of the paper is devoted to the analysis of the dependence between the households' risk of poverty and various features characterizing these households. Dependent variable Y is defined as follows:

$Y = 1$ (when the household is poor) / 0 (when the household is not poor).

By means of available data and classifications employed in households' budget research (BBGD) in 2008, qualitative characteristics have been taken into consideration as explanatory variables and have been ascribed with categories as follows:
– variable TS determining the social and economic type of household, where:

TS1 stands for households of workers,

TS 2 for households of farmers,

TS3 for households of people with private enterprises,

TS4 for households of pensioners,

TS5 for households whose members do not work and maintain themselves due to social benefit,

– variable M that determines the location of the household, where:

M1 stands for cities with a population of more than 100 thousand people,

M2 stands for towns with a population of fewer than 100 thousand people,

M3 stands for villages,

– variable R that determines the region in which the household is located, where:

R1 stands for the Central Region including łódzkie and mazowieckie voivodeships,

R2 stands for the South Region including małopolskie and śląskie voivodeships,

R3 stands for the East Region including lubelskie, podkarpackie, świętokrzyskie, and podlaskie voivodeships,

R4 stands for the North-West Region including wielkopolskie, zachodnio-pomorskie, and lubuskie voivodeships,

R5 stands for the South-West Region including dolnośląskie and opolskie voivodeships,

R6 stands for the North Region including kujawsko-pomorskie, warmińsko--mazurskie, and pomorskie voivodeships,

– variable L that assumes value 1 if the household possesses savings including deposit accounts in banks and other institutions, life insurance policies, bonds; and otherwise assumes value 0.

Moreover, two quantitative characteristics have been taken into account:

X_1 – the size of the household measured by the number of people in the household, where $X_1 = \{1, 2, 3, 4, 5, 6, 7+]$ and 7+ stands for a household of seven people or more, and

X_2 – number of children under 14 in the household, $X_2 = [0, 1, 2, 3, 4, 5+]$, 5+ stands for a household in which there are at least five children under 14.

The structures of households in regard to the aforementioned characteristics as well as to the fact of the household being considered poor or not are presented in Table 1.

The structure of households studied in BBGD in regard to the household's size and the number of children under 14 is presented in Table 2.

The data presented in Tables 1 and 2 show that among the households studied in BBGD research

– nearly 50% were households of workers,

– the majority (58%) of households was located in cities,

– the largest percentage (21.53) was the group of households from the Central Region,

Table 1. The structures of households in regard to various socioeconomic characteristics and whether they belong to the poverty sphere

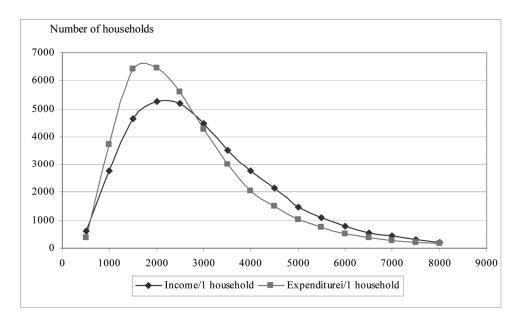| Classes of households in regard to:	Percentage of households	Percentage of households	
		poor ($Y = 1$)	not poor ($Y = 0$)
Household type TS:	100	14.32	85.68
TS1	49.96	13.8	86.2
TS2	5.36	22.68	77.32
TS3	6.63	7.79	92.21
TS4	34.35	13.13	86.87
TS5	3.70	31.88	68.11
Location M:	100.00		
M1	29.06	6.71	93.29
M2	28.81	11.89	88.11
M3	42.13	21.23	78.77
Region R:	100.00		
R1	21.53	10.06	89.94
R2	20.09	13.44	86.56
R3	17.78	19.39	80.61
R4	15.49	13.66	86.33
R5	10.68	12.43	87.57
R6	14.43	17.72	82.28
Possessed savings L:	100.00		
$L = 1$	20.46	7.29	92.71
$L = 0$	79.54	16.12	83.87
Number of households studied in BBGD research	37.358	5.348	32.010

Source: own calculations based on the BBDG data.

Table 2. The structure of households in regard to household's size and the number of children under 14

Number of persons in the household	Percentage of households	Number of children under 14 in the household	Percentage of households
1	17.61	0	69.02
2	28.08	1	18.15
3	21.44	2	9.80
4	18.43	3	2.27
5	8.41	4	0.53
6+	6.03	5+	0.23
	100.00		100.00

Source: own calculations based on the BBDG data.

– only 7.3% of households had savings and among those, the majority were bank deposit accounts (65%),
– households with no children under 14 were the majority (nearly 70%),
– small households were the majority as about 67% of households consisted of no more than three people,

– more than 14% of the households studied in the research belonged to the relative poverty sphere.

Figure 1. The distribution of average monthly income and expenditure per one household in 2008

Source: own calculations.

The distribution of average monthly income and expenditure per one household presented in Figure 1 and the parameters of this distribution presented in Table 3 indicate that households studied in the BBGD survey do not belong to wealthy households, 75% have an income of less than 3765.92 PLN (if all observations are to be taken into account), which is of significance in the analyses of the poverty sphere.

The distribution of income shows a very strong right asymmetry, which means that most households obtain the average income which is lower than the arithmetic mean, that is below 3007.11 PLN. Among the examined households only 3.5% were characterized by an average income of more than 7500 PLN. After rejecting these observations as resulting in serious mistakes, the basic parameters describing the distribution of income have been set once again. These parameters as well as the parameters calculated for all observations are presented in Table 3. The grounds for marking a household as poor was the relative poverty line set at the level of 50% of the average equivalent expenditure of households. This line, determined by means of the original OECD type 0.7/0.5 scale and on the basis of the data from the 2008 BBGD research amounted to 575.2 PLN. Households whose real expenditure calculated for an equivalent unit was lower than the established poverty line were labeled poor – that is belonging to the sphere of relative poverty.

Table 3. The parameters describing the distribution of average monthly income per one household in 2008

Parameters describing the distribution of income	On the basis of BBGD data	On the basis of data on income above 7500 PLN
Average income in a household	3,007.11	2,737.05
Median Q_2	2,518.59	2,475.64
First quartile Q_1	1,624.2	1,607.20
Third quartile Q_3	3,765.92	3,602.92
Maximum income	275,863.4	7,500.00
Standard deviation	2,957.87	1,479.48
Variation coefficient	0.98	0.54
Skewness coefficient	26.75	0.81

Source: own calculations on the basis of BBGD data.

The distribution of equivalence expenditure in all households and parameters of this distribution is presented in Figure 2 and Table 4. The distribution of income indicates that the households are not very wealthy.

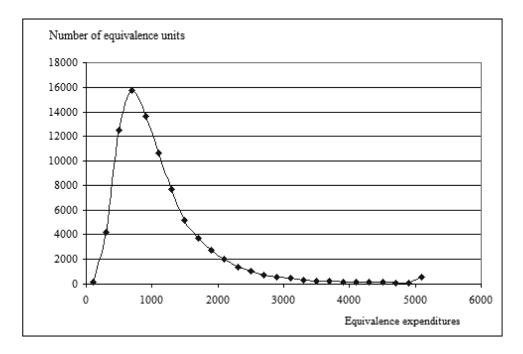**Figure 2.** The distribution of equivalence expenditure in 2008

Source: own calculations.

The dual tables using the BBGD individual data served as the basis for the testing hypotheses according to which a household being labeled as poor was

Table 4. Parameters describing the distribution of equivalence expenditure

Parameters	On the basis of BBGD data
Average expenditure/1 equivalence unit	1,150.4
Median Q_2	938.2
First quartile Q_1	655.9
Third quartile Q_3	1,362.3
Maximum expenditure	32,284.19
Standard deviation	928.9
Variation coefficient	0.807

Source: own calculations based on the BBDG data.

independent of other characteristics shown in Table 1. The values of test statistic χ^2 – which for different characteristics amounted to 849.26, 506.02, and 216.74 respectively, and were much higher than the critical values responding to various levels of significance – advocated rejecting this hypothesis and assuming an alternative hypothesis. The analysis of relative poverty risk in households has also been done by means of the logistic regression model, in which the probability of a household being labeled as poor is dependent on the type of the household (variable TS), location (including both the kind of location M and region R), possessed savings (variable $L = 1$) as well as the size of the household (variable X1) and the number of children under 14 (variable X2).[6]

Reference households consisted of one person worker households with no children under 14, located in the Central Region, in cities of over 100 thousand people, with no savings. The results of the estimation of the logit model are presented in Table 5. All parameter estimates are statistically significant, which means that the variables taken into consideration in this model have a significant influence on the probability of a household being labeled as poor.

When it comes to a group of reference households determined in this way, the positive values of parameter estimates indicate that households that are characterized by a higher probability of being labeled as poor in comparison to the reference households are households of types TS 4 and TS 5, located in villages in any region but the Central Region. The probability increases along with the increasing number of people in a household as well as with the increasing number of children under 14.

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[6] In [Czapiński, Panek (eds.) 2009] probit model was used to determine the poverty risk in both objective and subjective perspective. The following variables were used as explanatory variables: socio-economic group, size of household, class of location, education and age of household's head, number of unemployed and disabled people in household. The main aim of the paper [Kasprzyk, Fura 2011] is applying the logit regression model in order to evaluate the poverty risk in podkarpackie voivodeship.

Table 5. The results of the estimation of the logistic regression model for the probability of a household being labeled as poor

Explanatory variables	Estimate of parameter a_i	Standard error	p	Odds ratio
Constant	−3.549	0.066	0.000	0.029
TS2	−0.169	0.063	0.007	0.844
TS3	−0.682	0.081	0.000	0.506
TS4	0.528	0.040	0.000	1.695
TS5	1.559	0.069	0.000	4.752
M1	−0.552	0.053	0.000	0.576
M3	0.427	0.052	0.000	1.532
R2	0.232	0.056	0.000	1.261
R3	0.363	0.064	0.007	1.438
R4	0.211	0.055	0.000	1.235
R5	0.174	0.013	0.000	1.189
R6	0.502	0.021	0.012	1.653
L	−0.817	0.049	0.000	0.442
X1	0.40	0.050	0.000	1.492
X2	0.053	0.039	0.000	1.055
Fit measures	χ^2	Total loss		
	3,764.5	13,458.882		$p = 0.0000$

Source: own calculations on the basis of BBGD data.

Should one want to analyze the odds ratio presented in Table 5, it can be stated that:
– if households are of the same type and they are located in the same class of area and in the same region, the chance of a household being considered as poor increases 1.5 times per every additional person and the increase in the number of children results in the chance increased by 5.5 pp.,
– if households are of the same size, with the same number of children (under 14) and are located in the same region and area of the same class, TS 5 type of households are at greatest risk (the odds ratio amounts to 4.75),
– if households differ in the class of localization only, the chance of reaching poor status is almost 1.5 times higher for village households than for those located in towns with a population of fewer than 100 thousand people.

The negative values of parameter estimates in regard to other variables indicate that the decrease in the chance of reaching poor status is caused – among others – by the fact that the household is a household of people with private enterprises or farmers, that it has savings, and that it is located in a city of more than 100 thousand people. This is depicted by the probabilities of reaching poor status for different groups of households calculated on the basis of an estimate logit model presented in Table 6. The negative values of parameter estimates in regard to variables TS 2, TS 3, M1 and L are reflected in the lowest probabilities of reaching poor status by the households characterized by these variables. When analyzing the probabilities in

Table 6 one may notice that along with the increase in the number of people, the chance of a household being labeled as poor increases as well.

Table 6. Probabilities of a household without savings being labeled as poor on the basis of logit models for different types of households

Region	Location class	Household type	Probability $P(Y=1)$ when number of people = 1	Probability $P(Y=1)$ when number of people = 2
R3	M1	TS1	0.034	0.050
		TS2	0.029	0.043
		TS3	0.018	0.026
		TS4	0.057	0.082
		TS5	0.144	0.201
R3	M3	TS1	0.086	0.124
		TS2	0.074	0.106
		TS3	0.046	0.067
		TS4	0.138	0.193
		TS5	0.310	0.401
R6	M1	TS1	0.039	0.057
		TS2	0.033	0.049
		TS3	0.020	0.030
		TS4	0.065	0.094
		TS5	0.162	0.224

Source: own calculations based on BBGD data.

Similar calculations prepared for households of a different demographic composition and different status of possessed savings indicate that the highest probability of a household being labeled as poor characterizes households that are maintained by means of social benefit, located in villages in the East Region. On the other hand, the lowest probability of reaching poor status is attributed to households of people with private enterprises, located in cities of more than 100 thousand people in the Central Region.

5. Evaluation of poverty sphere in regional approach

The relative poverty line established on the level of half the average equivalent expenditure served as the basis for determining the relative poverty rate as well as the average expenditure gap for the collective of all households studied in BBGD research as well as for the collective of households located in given regions (formulas (5) and (6)). The results are presented in Table 7.

As it is possible to see, the Central Region is characterized by the lowest indicators depicting both the range and the depth of poverty. Most vulnerable to poverty are households located in the East and North Regions, with the risk growing even higher in the case of households with children under 14. Both these regions are characterized by high values of all kinds of poverty rates as well as by the average

expenditure gap. These statements are reflected in the value of average expenditure presented in Tables 8 and 9.

Table 7. Relative poverty rates and the average expenditure gap in regions of Poland in 2008

Region	Poverty rate as % of the poor:				Average expenditure gap
	households	people	equivalent units	children under 14	
Poland	14.3	18.7	17.8	24.9	0.218
Central	10.1	13.4	12.7	18.7	0.215
South	13.4	17.2	16.4	23.5	0.204
East	19.4	24.0	23.3	28.3	0.235
North-West	13.7	18.0	17.2	23.9	0.208
South-West	12.4	16.3	15.6	21.2	0.210
North	17.7	23.4	22.2	32.6	0.224

Source: own calculations on the basis of BBGD data

Table 8. Average expenditure in the collective of all BBGD studied households

Region	Average expenditure in the collective of all BBGD studied households per:		
	1 household	1 person	1 equivalent unit
Poland	2602.18	885.21	1150.40
Central	2883.12	1038.33	1335.58
South	2562.73	884.24	1144.59
East	2428.31	760.39	1001.73
North-West	2558.56	848.11	1105.59
South-West	2631.40	954.22	1225.48
North	2482.13	831.49	1087.95

Source: own calculations on the basis of BBGD data.

Table 9. Average expenditure in the collective of poor households

Region	Average expenditure in the collective of poor households per:		
	1 household	1 person	1 equivalent unit
Poland	1258.11	327.88	446.24
Central	1233.02	332.72	450.65
South	1251.43	337.89	457.46
East	1273.91	321.98	438.22
North-West	1307.26	329.94	450.39
South-West	1205.67	333.34	448.22
North	1251.66	317.74	437.84

Source: own calculations on the basis of BBGD data.

Should one like to use the average expenditure as household wealth indicator it is possible to state that both in the collective of all studied households and in the collective of poor households, the households located in the Central Region are in the best situation and those located in the East and North Regions are in the worst.

6. Conclusions

The main aim of this paper was to evaluate the significance of influence of chosen socioeconomic characteristics attributed to households in Poland on the probability of a household being labeled as belonging to the sphere of relative poverty. The logistic regression model has been used for that purpose. As a consequence, results have been obtained that made it possible to put forward the following conclusions:
– all variables taken into consideration in the analyses of relative poverty had a significant influence on the probability of a household being labeled as poor,
– among the characteristics that increase the risk of reaching poor status one should include the size of the household and the number of children under 14, while among the characteristics that reduce the risk – possessed savings,
– in 2008 the households at greatest risk were those maintained by means of social benefit, located in villages in the East or North Region, with no savings,
– the smallest risk of a household being labeled as poor was limited to one person households with private enterprises, with savings, located in cities of more than 100 thousand people, in the Central Region.

The paper evaluated and compared the spheres of relative poverty in regional approach with the application of the basic and most often used poverty indicators, that is the relative poverty rate and average expenditure gap. Analysis of the range and depth of poverty confirms the previous results as both the values of poverty rates and of the average expenditure gap suggest that the worst situation is to be found in the East and North Regions, while the best is to be found in the Central Region.

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MODEL REGRESJI LOGISTYCZNEJ W ANALIZACH UBÓSTWA

Streszczenie: Głównym celem artykułu jest określenie determinant ubóstwa, czyli tych czynników, które zwiększają ryzyko zagrożenia ubóstwem oraz dokonanie oceny stopnia zagrożenia gospodarstw domowych tym zjawiskiem za pomocą modelu regresji logistycznej. Drugi cel referatu to próba dokonania oceny i porównań sfery ubóstwa relatywnego w ujęciu regionalnym z wykorzystaniem najważniejszych wskaźników ubóstwa. Wyniki wskazują na regiony wschodni oraz północny jako najbardziej zagrożone ubóstwem, na region centralny natomiast jako zagrożony w najmniejszym stopniu. Źródłem danych w obydwu przypadkach były nieidentyfikowalne dane jednostkowe pochodzące z badań budżetów gospodarstw domowych realizowanych przez GUS w 2008 r. i udostępnionych do celów badań naukowych.

Słowa kluczowe: ubóstwo obiektywne, wskaźniki ubóstwa, względne ryzyko, iloraz szans, model logitowy.